The FAIR Metrics of Adherence to Citation Best Practices

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Abstract

Measuring the merits of scholarly research articles only by citation counts and how often other research articles or social media messages cite a particular publication creates a perverse incentive for some authors to refrain from citing potential rivals. This dilemma has developed despite the historical publishing standard expected in peer review for citing and discussing related prior work. To encourage and support a countervailing incentive, research organizations should also consider metrics for how well and appropriately a scholarly article cites relevant prior work in the spirit of the classic phrase and metaphor standing on the shoulders of giants. We present a proposal for a family of such article-level metrics called the FAIR metrics and described as the FAIR Attribution to Indexed Reports or the FAIR Acknowledgment of Information Records.

Methods

We started by identifying key requirements for the metric, identified the core concepts they concern, and defined abstractions to represent them.

<table>
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<th>Feature</th>
<th>Description</th>
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<td>Distinguishes plagiarism from errors in citation</td>
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<tr>
<td>Distinguishes well-citing works from ones with errors</td>
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<td>Consistent even when bad practices are common</td>
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<td>Table against attempts at obfuscation</td>
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<td>Allows comparison across problem domains</td>
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<td>Allows for common knowledge</td>
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Table 1: Prioritized (high-to-low) features of a FAIR Metric

While some of these goals, such as reliably keeping track of what statements are common knowledge in a given field, are challenging and may not be practical, recent developments in semantic text analysis support the feasibility of the central goal of distinguishing legitimate reports of research from acts of plagiarism. In particular, semantic analysis approaches can detect similarity of ideas despite strong obfuscation through paraphrasing [3]. To define our metrics, we first identified and defined six key concepts.

Concept a word or phrase equivalent to an item in a formal ontology or other controlled vocabulary. Define two Concepts to be equivalent if and only if they map to the same term in one or more controlled vocabularies.

Statement a statement that we can represent semantically as an ordered triple of subject, verb, and object Concepts. Define two Statements to be equivalent if they can be represented as the same subject-verb-object triple.

Report a scholarly work, such as a primary research article or a secondary review article, a description of which we represent as a set of Statements.

Citation a triple indicating that a Statement includes a citation of a Report as its source.

Index a set of Reports available for comparison.

Metric a function quantifying presence of a given citation practice, good or bad, in a Report.

Results

Let $I$ be an Index and $b$ be a Report in $I$.

Correctly Attributed Statements $\alpha(b, I)$ be the number of Statements in $b$ that it attributes to any other Report that contains an equivalent Statement.

Misattributed Statements $\mu(b, I)$ be the number of Statements in $b$ that it attributes to any Report that does not contain an equivalent Statement.

Potentially Plagiarized Statements $\rho(b, I)$ be the number of Statements in $b$ that it does not attribute to a prior Report but that have equivalent Statements in at least one prior Report in $I$.

Appendix Original Statements $\kappa(b, I)$ be the number of Statements in $b$ that it does not attribute to a prior Report and that have no equivalent Statement in any prior Report in $I$.

For example, manually parsing the abstract of research articles, including ones free of citation errors, ones with correctable mistakes, and ones that have been retracted for plagiarism. Once we have a suitable sampling of results, we will use appropriate statistical tests to judge which metrics differ significantly among these three categories.

Future Work

To evaluate the utility of the metrics we have described here, we will need to evaluate them on a set of scholarly articles, including ones free of citation errors, ones with correctable mistakes, and ones that have been retracted for plagiarism.

References


